DECLARATION

I, the undersigned, Tomotoshi NAKAI, c/o NEC Patent Service Ltd., of Goyou-Shibaura Building, 5-11, Shibaura 4-chome, Minato-ku, Tokyo, Japan, do hereby solemnly and sincerely declare that I am familiar with the English and Japanese languages, that I have prepared the attached English translation which is a full, true and faithful one of the patent application filed with the Patent Office of Japan under the Application No. 243942/2000 and that the present declaration is intended for use in connection with a patent application placed before the United States Patent and Trademark Office.

I further declare that all statements made herein in my own knowledge and belief are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issuing thereon.

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[Document Name] Specification

[Title of the Invention] Connection-display device and connection-display method

[Scope of Claims]

[Claim 1] A connection-display device, comprising:

a screen; and

a plurality of display units that display respectively a plurality of pictures coinciding in positions on the screen, wherein:

a master display unit of the plurality of display units includes a generation unit which generates an on-screen picture to be displayed on the screen; and

a slave display unit of the plurality of display units includes an erasure unit which erases a portion of the pictures of a display region corresponding to the on-screen picture.

[Claim 2] The connection-display device according to claim 1,

wherein the erasure unit erases the portion by displaying the display region in black.

[Claim 3] The connection-display device according to claim 1, wherein:

the plurality of display units include:

an on-screen set unit;

an on-screen display unit which displays the on-screen picture; and

an on-screen data communication unit;

the on-screen set unit of the master display unit sets the on-screen picture to be displayed in the on-screen display unit;

on-screen data corresponding to the on-screen picture which is set in the on-screen set unit of the master display unit is transmitted to the on-screen set unit of the slave display unit via the on-screen data communication unit of the master display unit and the on-screen data communication unit of the slave display unit; and

the on-screen display unit of the slave display unit serves as the erasure unit.

[Claim 4] The connection-display device according to claim 3, wherein:

the on-screen data communication unit includes:

a first on-screen data communication unit;

a second on-screen data communication unit; and

a third on-screen data communication unit; and

the on-screen data is transmitted to the on-screen set unit of the slave display unit via the first on-screen data communication unit of the master display unit, the third on-screen data communication unit of the maser display unit, the second on-screen data communication unit of the slave display unit, and the first on-screen data communication unit of the slave display unit.

[Claim 5] The connection-display device according to claim

4, wherein:

the slave display unit includes:

a first slave display unit; and

a second slave display unit; and

the on-screen data of the on-screen set unit of the first slave display unit is transmitted to the on-screen set unit of the second slave display unit via the first on-screen data communication unit of the first slave display unit, the third on-screen data communication unit of the first slave display unit, the second on-screen data communication unit of the second slave display unit, and the first on-screen data communication unit of the second slave display unit.

[Claim 6] The connection-display device according to claim 5,

wherein a configuration of the master display unit is the same as a configuration of the slave display unit.

[Claim 7] The connection-display device according to any one of claims 3 to 6,

wherein the erasure unit erases the portion by displaying the display region in black.

[Claim 8] The connection-display device according to claim 7,

wherein the on-screen picture includes a black frame, and the on-screen picture is superposed on the portion which is displayed

in black.

[Claim 9] The connection-display device according to claim 1,

wherein any display unit of the plurality of display units can be selected as one of the master display unit and the slave display unit.

[Claim 10] A connection-display method, comprising:

displaying a first picture on a screen by a first display unit;

displaying a second picture which is identical to the first picture on the screen by a second display unit;

superposing the first picture and the second picture on each other;

displaying an on-screen picture in the first picture by the first display unit; and

erasing a portion of the second picture of a display region which corresponds to a display region of the on-screen picture by the second display unit.

[Claim 11] The connection-display method according to claim 10, further comprising:

displaying another on-screen picture in the second picture by the second display unit; and

erasing a portion of the first picture of a display region which corresponds to a display region of the other on-screen picture by the first display unit.

[Claim 12] The connection-display method according to claim 10,

wherein the on-screen picture comprises an adjustment menu for adjusting the picture.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention belongs]

The present invention relates to a connection-display device and a connection-display method, and more particularly to a connection-display device and a connection-display method which superpose and display identical pictures by using a plurality of display units while it is taken into consideration that an on-screen picture overwritten on a base screen during an image adjusting operation is not made difficult to see.

[0002]

[Prior Art]

A display system which superposes and displays a plurality of identical pictures by use of a plurality of picture display units has been developed by the inventors of the present invention (not yet disclosed). Such a display system is expected to be used in a case where it is desired to display pictures more brightly than with just a single display unit.

[0003]

In such a display system, in executing an on-screen display

operation such as image adjustment menu display used for screen adjustment, a base picture and an on-screen picture are superposed and displayed in double. Thus, there are some cases where it is difficult to see the on-screen picture. What is desired next is that the on-screen picture is clearly displayed so that it is easy to look at.

[0004]

[Problems to be solved by the Invention]

It is an object of the present invention to provide a connection-display device and a connection-display method which are capable of displaying a clear, easy-to-view, on-screen picture.

[0005]

[Means for solving the Problems]

Means for solving the problem is described as below. Reference numerals and symbols are given with parentheses to technical elements in the description. The reference numerals and symbols are identical to reference numerals and symbols that are given to technical elements which constitute at least one of plural embodiment modes or embodiments of the present invention, in particular, technical elements shown in the drawings which correspond to the embodiment modes or embodiments. The reference numerals and symbols clearly relate or associate technical elements stated in claims to or with the technical elements in the embodiment modes or embodiments. This does not mean that the technical elements

stated in the claims are construed as being limited to the technical elements in the embodiment modes or embodiments.

[0006]

A connection-display device according to the present invention includes: a screen (4); and a plurality of display units (1, 2, 3) that display respectively a plurality of pictures coinciding in positions on the screen (4), in which: a master display unit (1) of the plurality of display units (1, 2, 3) includes a generation unit (15 of the master display unit 1) which generates an on-screen picture to be displayed on the screen (4); and a slave display unit (2, 3) of the plurality of display units (1, 2, 3) includes an erasure unit (15 of the slave display unit 2 and the slave display unit 3) which erases a portion of the pictures of a display region corresponding to the on-screen picture.

[0007]

The erasure unit (15) erases the portion by displaying the display region in black. The plurality of display units (1, 2, 3) include an on-screen set unit (11), an on-screen display unit (15) which displays the on-screen picture, and an on-screen data communication unit (7, 8, 9), the on-screen set unit (11) of the master display unit (1) sets the on-screen picture to be displayed in the on-screen display unit (15), on-screen data (14) corresponding to the on-screen picture which is set in the on-screen set unit (11) of the master display unit (1) is transmitted to the on-screen

set unit (11) of the slave display unit (2) via the on-screen data communication unit (7, 9) of the master display unit (1) and the on-screen data communication unit (7, 8) of the slave display unit (2), and the on-screen display unit (15) of the slave display unit (2) serves as the erasure unit(15).

[0008]

The on-screen data communication unit includes a first on-screen data communication unit (7), a second on-screen data communication unit (8), and a third on-screen data communication unit (9), and the on-screen data (14) is transmitted to the on-screen set unit (11) of the slave display unit (2) via the first on-screen data communication unit (7) of the master display unit (1), the third on-screen data communication unit (9) of the maser display unit (1), the second on-screen data communication unit (8) of the slave display unit (2), and the first on-screen data communication unit (7) of the slave display unit(2).

[0009]

The slave display unit includes a first slave display unit (2), and a second slave display unit (3), and the on-screen data (14) of the on-screen set unit (15) of the first slave display unit (2) is transmitted to the on-screen set unit (11) of the second slave display unit (3) via the first on-screen data communication unit (7) of the first slave display unit (2), the third on-screen data communication unit (19) of the first slave display unit (2),

the second on-screen data communication unit (8) of the second slave display unit (3), and the first on-screen data communication unit (7) of the second slave display unit (3).

[0010]

The erasure unit (15 of the slave display unit 2 and the slave display unit 3) erases the portion by displaying the display region in black. The on-screen picture includes a black frame, and the on-screen picture is superposed on the portion which is displayed in black. Any display unit of the plurality of display units can be selected as one of the master display unit (1) and the slave display unit (2).

[0011]

A connection-display method according to the present invention includes: displaying a first picture on a screen (4) by a first display unit (1); displaying a second picture which is identical to the first picture on the screen (4) by a second display unit (2); superposing the first picture and the second picture on each other; displaying an on-screen picture in the first picture by the first display unit (1); and erasing a portion of the second picture of a display region which corresponds to a display region of the on-screen picture by the second display unit (2).

[0012]

The connection-display method further includes: displaying another on-screen picture in the second picture by the second display

unit (1); and erasing a portion of the first picture of a display region which corresponds to a display region of the other on-screen picture by the first display unit (1). The on-screen picture includes an adjustment menu for adjusting the picture.

[0013]

[Embodiment Mode of the Invention]

As correspondingly shown in the figure, in a connection-display device according to an embodiment of the present invention, a plurality of display units and a common screen are provided. The plurality of display units are composed of a combination of a master display unit 1, a first slave display unit 2, and a second slave display unit 3, as shown in Fig. 1. The master display unit 1, the first slave display unit 2, and the second display unit 3 are disposed so as to face a common screen 4.

[0014]

The master display unit 1, the first slave display unit 2, and the second display unit 3 are capable of superposing exactly the same pictures on the common screen 4. Further, by increasing the number of identical pictures superposed with additional display units, it is possible to make bright portions in a single picture projected on the screen 4 brighter.

[0015]

A picture signal 30 to be reproduced is input to the master display unit 1. The same picture signal 30 is output from the master

display unit 1 and is input to the first slave display unit 2 via a first picture cable 31. The same picture signal as the picture signal 30 which is input to the first slave display unit 2 is output from the first slave display unit 2 and is input to the second slave display unit 3 via a second picture cable 32.

[0016]

The master display unit 1, the first slave display unit 2, and the second slave display unit 3 are exactly the same system as shown in Fig. 2. However, the master display unit 1 is different from the first slave display unit 2 and the second slave display unit 3 in their usage. Except for the case where special distinction among them is required, the master display unit 1, the first slave display unit 2, and the second slave display unit 3 will be commonly referred to as display units, and will be represented by a display unit 1. The display unit 1 includes a projection display unit 5 which generates a picture to be projected on the screen 4, a data processing unit 6, and communication units. The communication units include a first communication unit 7 which is commonly used for transmission and reception, a second communication unit 8 which is used for reception (or for transmission), and a third communication unit 9 which is used for transmission (or for reception).

[0017]

The data processing unit 6 includes an on-screen set unit 11 in which an on-screen is set, and the first communication unit 7.

The projection display unit 5 includes a picture display unit 13 which generates a basic picture based on the picture signal 30 input to the display unit 1 and displays the basic picture, and an on-screen picture display unit 15 which generates an on-screen picture based on an on-screen data 14 that is set by the on-screen set unit 11 and is output from the on-screen set unit 11 and displays the on-screen picture. The projection display unit 5 projects pictures generated by the picture display unit 13 and the on-screen picture display unit 15 onto the screen 4. The on-screen picture may be overwritten on the basic picture.

[0018]

Although the first communication unit 7 can be connected bidirectionally to the second communication unit 8 and the third communication unit 9, in actual uses, the second communication unit 8 is connected unidirectionally to the first communication unit 7, and the first communication unit 7 is connected unidirectionally to the third communication unit 9. The display unit 1 includes a key group 16 by which the on-screen data 14 is input to the on-screen set unit 11 through key operation.

[0019]

The on-screen data 14 which is input to and set in the on-screen set unit 11 of the master display unit 1 is input to the on-screen picture display unit 15 of the master display unit 1, and an on-screen picture 17 is formed on the on-screen picture display unit 15 based

on the on-screen data 14, as shown in Fig. 3(a). The on-screen picture 17 is overwritten on the basic picture 18.

[0020]

The on-screen data 14 or data corresponding to the on-screen data 14 (for example, data of only the frame of the on-screen picture 17, which will be represented by the on-screen data 14 hereinafter) is output from the master display unit 1 via the first communication unit 7 of the master display unit 1 and the third communication unit 9 of the master display unit 1, and is input to the first slave display unit 2. The on-screen data 14 is then input to the on-screen set unit 11 of the first slave display unit 2 via the second communication unit 8 of the first slave display unit 2 and the first communication unit 7 of the first slave display unit 2.

[0021]

The on-screen set unit 11 of the first slave display unit 2 outputs an on-screen data 14' that corresponds to the on-screen data 14 but is not the same as the on-screen data 14, and the on-screen data 14' is input to the on-screen picture display unit 15 of the first slave display unit 2. Based on the on-screen data 14', the on-screen picture display unit 15 of the first slave display unit 2 erases a portion of the basic picture 18 of the same on-screen picture region that corresponds to the on-screen picture 17 of the on-screen picture display unit 15 of the master display unit 1. The erasure operation is performed, for example, by displaying a

portion of the basic picture 18 of the on-screen picture region in black, as shown in Fig. 3(b).

[0022]

The on-screen data 14' is output from the first slave display unit 2 via the first communication unit 7 of the first slave display unit 2 and the third communication unit 9 of the first slave display unit 2 and is input to the first slave display unit 2. The on-screen data 14' is input to the on-screen set unit 11 of the second slave display unit 3 via the second communication unit 8 of the second slave display unit 3 and the first communication unit 7 of the second slave display unit 3. The on-screen set unit 11 of the second slave display unit 3 outputs the on-screen data 14' that is the same as the on-screen data 14' and the on-screen data 14' is input to the on-screen picture display unit 15 of the second slave display unit 3.

[0023]

Based on the on-screen data 14', the on-screen picture display unit 15 of the second slave display unit 3 erases a portion of the basic picture 18 of the same on-screen picture region that corresponds to the on-screen picture 17 of the on-screen picture display unit 15 of the master display unit 1. The erasure operation is performed, for example, by displaying a portion of the basic picture 18 of the on-screen picture region in black, as shown in Fig. 3(c).

[0024]

As shown in Fig. 3(d), the formed on-screen picture in Fig. 3(a) of the master display unit 1, the formed black on-screen picture in Fig. 3(b) of the first slave display unit 2, and the formed black on-screen picture in Fig. 3(c) of the second slave display unit 3 are superposed and projected on the screen 4, as shown in Fig. 3(d). If portions of the basic pictures remain without being erased by the portions displayed in black as shown in Figs. 3(b) and 3(c), the remaining picture portions and the on-screen picture 17 in Fig. 3(a) are superposed and displayed in double. Thus, the on-screen picture 17 thus formed is difficult to view.

[0025]

However, since the amount of information of an on-screen picture 17' of the on-screen picture display unit 15 of the first slave display unit 2 and the on-screen picture 17' of the on-screen picture display unit 15 of the second slave display unit 3 is substantially zero, the on-screen picture 17 of the on-screen picture display unit 15 of the master display unit 1 alone is projected on the display region. However, the outline of the portion displayed in black of the on-screen picture 17' may remain as a frame.

[0026]

The on-screen picture includes an adjustment menu of the projected image, such as a color adjustment menu. An operator manipulates the master display unit 1 by means of a remote control unit while viewing the menu to execute various screen adjustments.

The on-screen picture is not formed only on the master display unit 1, but another on-screen picture is formed on the first slave display unit 2 or the second slave display unit 3.

[0027]

In this case, displaying in black corresponding to the on-screen picture formed on the first slave display unit 2 is applied to the master display unit 1 and the second slave display unit 3. The exchange of the functions of the master display unit 1 and the first slave display unit 2 is feasible. With this exchange, the master display unit 1 functions as a slave display unit, and the first slave display unit 2 functions as a master display unit. The master display unit 1, the first slave display unit 2, and the second slave display unit 3 are exactly the same system and there is no difference among them based on their functions, thus providing a high mass-productivity.

[0028]

A larger number of display units may be arranged two-dimensionally (in rows and columns). The identical picture signal 30 may be input to a plurality of display units in parallel instead of being sequentially input to the plurality of display units.

[0029]

[Effects of the Invention]

In the connection-display device and the connection-display

method according to the present invention, a plurality of display units are not completely independent and the plurality of display units are dependent in a master-slave relationship manner with respect to the on-screen. Therefore, a single on-screen picture is projected (without being displayed in double), and at the time of the screen adjustment while viewing the on-screen picture, the picture may be clearly recognized.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a diagram showing a unit structure of a connection-display device according to an embodiment of the present invention.

[Fig. 2]

Fig. 2 is a circuit block diagram showing details of a display unit.

[Fig. 3]

Fig. 3 is a picture diagram showing a connection-display method according to an embodiment of the present invention.

[Description of Reference Numerals]

1, 2, 3...connection-display device

1...master display unit

2, 3...slave display unit

4...screen

7, 8, 9...on-screen data communication unit

11...on-screen set unit

14, 14'...on-screen data

15...generation unit (on-screen display unit, erasure unit)

整理番号＝２１１１０００６

【書類名】　図面
[Document Name] Drawings

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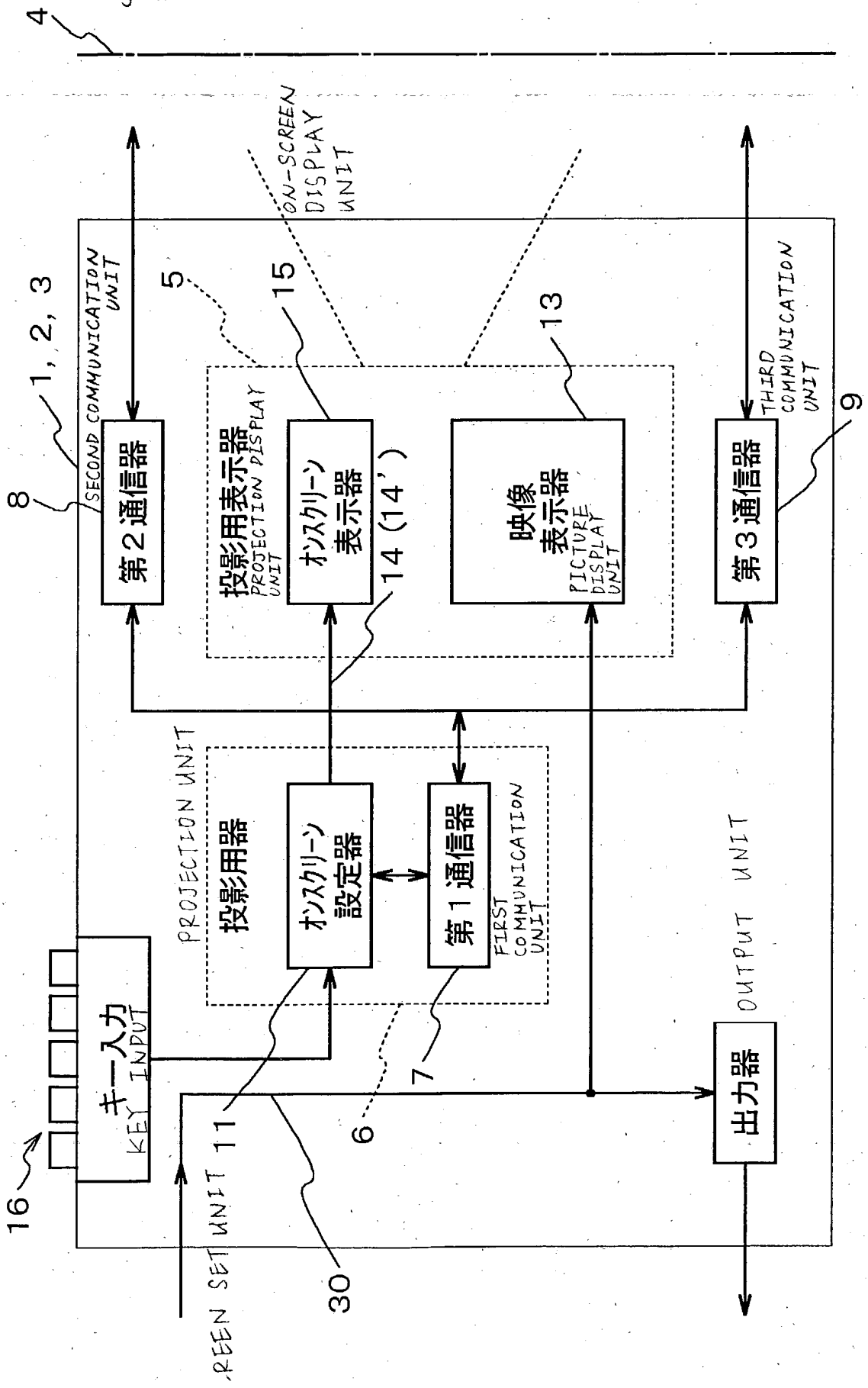
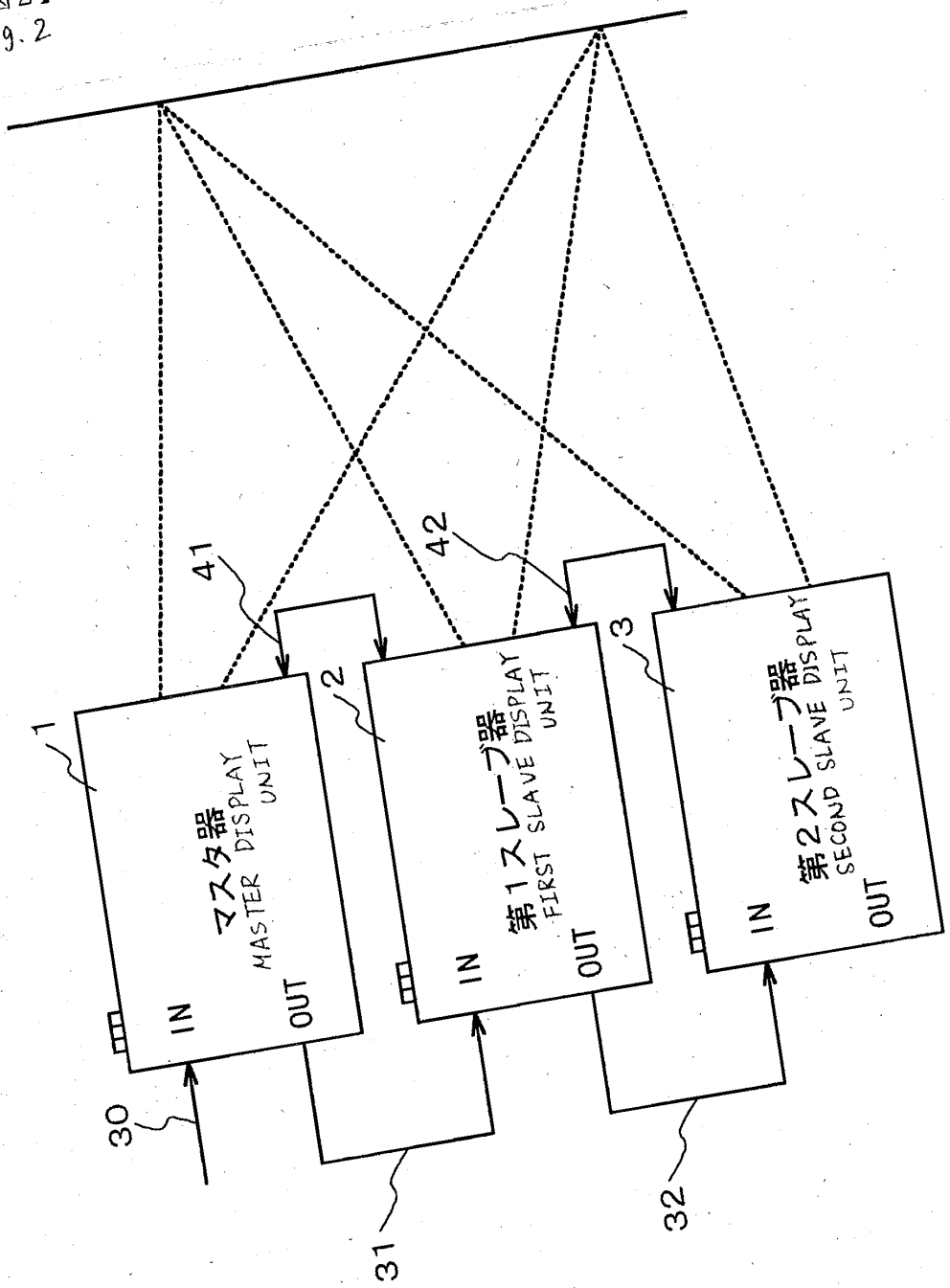
特願2000-243942　　頁:

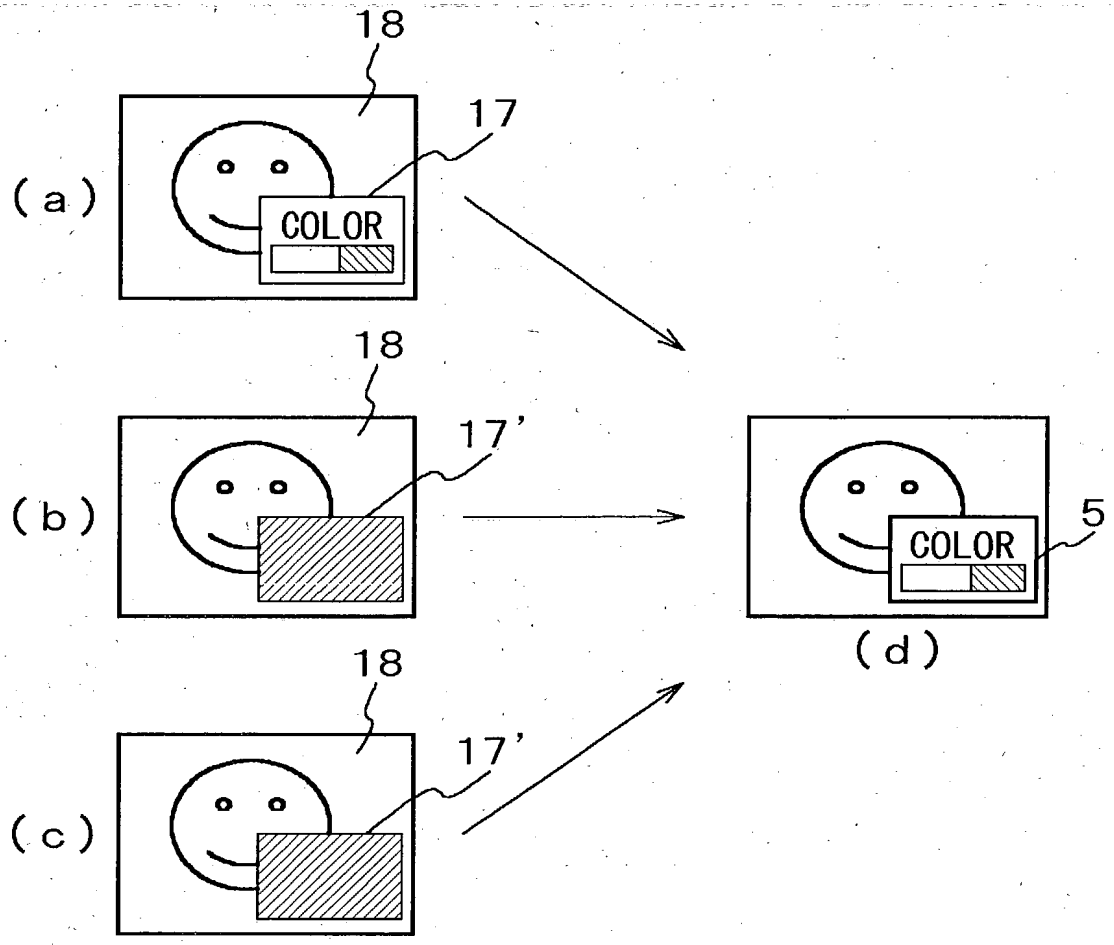
【図１】
Fig. 1



【図２】
Fig. 2


マスタ器
MASTER DISPLAY UNIT
IN
OUT
第１スレーブ器
FIRST SLAVE DISPLAY UNIT
IN
OUT
第２スレーブ器
SECOND SLAVE DISPLAY UNIT
IN
OUT
1
2
3
30
31
32
41
42

【図３】
Fig. 3



[Document Name] Abstract

[Summary]

[Object] To display a clear, easy-to-view, on-screen picture.

[Solving Means] A connection-display device includes a plurality of display units 1, 2, and 3 which respectively display a plurality of pictures coinciding in positions on a screen 4, in which a master display unit 1 of the plurality of display units includes a generation unit (on-screen display unit 15 of the master display unit 1) that generates an on-screen picture to be displayed on the screen 4, and slave display units 2 and 3 of the plurality of display units include an erasure unit (on-screen display unit 15 of the slave display unit 2 and the slave display unit 3) that erases a portion of the picture of a display region corresponding to the on-screen picture. The slave display units 2 and 3 perform on-screen display, for example, by displaying a portion in black, which does not make the on-screen picture of the master display unit 1 difficult to view.

[Selected Drawing] Fig. 1